

SCIENCE

NEW YORK, NOVEMBER 10, 1893.

THE WASHINGTON ANTHROPOLOGISTS ASK FOR A DEFINITION—THE CHIEF JUSTICE AND THE VICE PRESIDENT WILL DETER- MINE ITS QUALITY.

THERE is a product of our country that far exceeds in value all its cotton, its corn and its useful minerals. We have no lines of figures in our census returns to set forth this value; the product is so nearly inestimable that we have not as yet discovered a method of tabulating and expressing its worth. Thousands of millions of dollars would certainly fail to cover its cash cost to the commonwealth. Our schools, our colleges, our churches, and our domestic hearths are established and maintained to form and fashion this precious product, and a large part of the time and energy and the best and longest thoughts of our noblest men and women are dedicated to the same important end.

This infinitely valuable, this inestimable product is—the useful citizen.

It is manifest that among the hundreds of thousands of useful citizens nurtured and sent forth into the battle of life there exists the widest difference in character and capacity, and, consequently, the widest difference in their individual value to the state.

When we rehearse their services and sum up in our minds how much our country has been bettered and aggrandized by Abraham Lincoln, Benjamin Franklin, Peter Cooper, C. P. Huntington, Robert Fulton, Thomas Edison, and James Russell Lowell, and imagine our national existence deprived of their work and influence, we comprehend the enormous relative value of such men to the commonwealth. Indeed, is it too much to say that the nation could better afford to lose, by emigration to some pleasant foreign clime, the entire population of one or more of our forty-four states, rather than have blotted from our history the work and influence of the seven fellow citizens we have named?

These men performed their great services for us, for our nation, and for humanity because they were possessed of certain qualities, faculties and characteristics that gave them power to perceive, grasp, mould and control the elements around them, and such desirable attributes are possessed, in a greater or less degree, by every useful citizen. But in the *most useful citizen* will be grouped the most desirable and most useful characteristics in the greatest number and of the highest quality.

That they are sometimes so grouped that in one man may exist the potentiality of becoming the most useful citizen in whatever occupation or environment he may thereafter attain to in the community, is shown by a consideration of the best-known of the persons mentioned—Benjamin Franklin.

We find this individual, in the most widely differing relations in life, performing his part with admirable perfection. He was a good journeyman printer and a skilful manufacturer and publisher. His part as a shopkeeper he played well. He excelled as an inventor of the most diverse contrivances, such as stoves, musical instruments and electrical apparatus. He was a philosopher of high rank, and for his accomplishments in statescraft his countrymen will always honor his memory. His faculty and foresight in founding and fostering public

institutions of benevolence and literary and scientific culture is patent to us after the lapse of a century and a half. His eminence as a diplomat is conceded, and as a man of the world, of tact, of brilliant social attainment, his experience at the French court bears ample testimony. Every one acknowledges his singular ability as an editor, as a polemic, and as a humorist. Of his aptitude as a linguist, a financier, a military leader, an orator, a post-master general, a physical geographer and as a public-spirited citizen, history gives sufficient proof.

Now all the elements that produced this high degree of usefulness in so many forms of desirable human activity, existed potentially in the citizen Franklin when aged seventeen he landed in Philadelphia, and strode up Market street with his loaf of bread under his arm. He then possessed his vigorous muscular system, his fine digestion, his well-balanced physique, his strong social instincts, his active brain, with its scores of functions working harmoniously, his quick, responsive nerves, his optimism, his enterprise, his undaunted will, his abiding patience, his ingenuity, his economy, his sound judgment, his self-reliance, and a score of additional qualities which modern science, armed with every device that invention can conceive, is striving to weigh, measure and define.

It is a description of a bases of character such as is here outlined, given in terms as accurate as the most advanced knowledge will permit, that, we assume, the Anthropological Society of Washington seeks when it asks, in the following announcement, for a definition, in 3000 words, of "The most useful citizen of the United States, regardless of occupation."

"A member of the Anthropological Society of Washington 'has placed in the hands of the Treasurer of the Society a 'sum of money to be awarded in prizes for the clearest 'statements of the elements that go to make up the most 'useful citizen of the United States, regardless of occupation. The donation has been accepted, and the Society 'has provided for the award of the following prizes during 'the present year (1893) under the following conditions:

"Two prizes will be awarded for the best essays on the 'subject specified above, viz: A first prize of \$150 for the 'best essay, and a second prize of \$75 for the second best 'essay among those found worthy by the commissioners of 'award.

"These prizes are open to competitors in all countries.

"Essays offered in competition for the prizes shall not 'exceed 3,000 words in length, and all essays offered shall 'be the property of the Anthropological Society of 'Washington, the design being to publish them at the 'discretion of the Board of Managers, in the official organ 'of the Society, the *American Anthropologist*, giving due 'credit to the several authors.

"Each essay should bear a pseudonym or number, and 'should be accompanied by a sealed envelope bearing the 'same pseudonym or number, and containing the name and 'address of the competitor; and the identity of competitors 'shall not in any way be made known to the Commission- 'ers of Award.

"Essays must be type-written or printed, and must be 'submitted not later than November 1, 1893. [Since 'changed to March 1, 1894.]

"While it is not proposed by the Society to limit the 'scope of the discussion, and while each essay will be con- 'sidered on its merits by the Commissioners of Award, it is 'suggested, in view of the character of the Society and the 'wishes of the donor of the prize fund, that the treatment 'be scientific, and that the potential citizen be considered

"(1) from the point of view of anthropology in general, "including heredity, anthropometry, viability, physiological psychology, etc.; (2) from the point of view of personal "characteristics and habits, such as care of the body; "mental traits, manual skill, sense training and specialization, and all-round manhood; and (3) from the ethical "point of view, including self-control, humanity, domesticity, charity, prudence, energy, *esprit de corps*, patriotism, "etc.

"The essays offered in competition for the citizenship "prizes of the Anthropological Society of Washington will "be submitted, on or about November 2, 1893 [changed to "March 1, 1894,] to five Commissioners of Award, including, it is proposed, one anthropologist, one jurist, one "statesman, one educator, and one other not yet specified, "all of national reputation, of whom at least one and not "more than two shall be members of the Society; and the "award shall be made in accordance with the findings of "these Commissioners.

"The award will be made in accordance with the finding of the following-named five Commissioners, whose "acceptances were announced in the *Anthropologist* for November:

"Dr. Daniel G. Brinton, of the University of Pennsylvania; Dr. Daniel C. Gilman, President of Johns Hopkins University; Melville W. Fuller, Chief Justice of the "United States Supreme Court; Adlai E. Stevenson, Vice-President of the United States, and Dr. Robert H. Lam-born.

"Essays submitted in competition for the prizes should "be delivered not later than November 1, 1893, [changed to "March 1, 1894,], to the Secretary of the Board of Managers "of the Society, Mr. Weston Flint, No. 1101 K street, N. W., "Washington, D. C., to whom all correspondence relating "to the prizes should be addressed."

NOTES AND NEWS.

WE have received from Cyrus W. Bardeen, of Syracuse, a number of his educational publications. One of them is a paper of his own on "The History of Educational Journalism in the State of New York," which he read at the Columbian Exposition in July. It gives a very full account of the various educational periodicals that have at different times been published in the State; and most readers will be surprised at the number of them. Unfortunately, their quality has not been comparable to their number; but there is reason to think that the historian of the next century will be able to chronicle an improvement in this respect. Another of the books referred to is a brief paper on the "History of the Philosophy of Pedagogics," by Charles W. Bennett. The author was formerly a theological professor, and we judge that the book is a syllabus of lectures that he sometimes delivered, for it is a mere outline suitable only as a basis for oral teaching. The most interesting book in the collection is that on "The Educational Labors of Henry Barnard," by Will S. Monroe, being a brief biography of Dr. Barnard with some account of his educational writings. The processes of his own education are very briefly described; but a fuller account is given of his work as Superintendent of Schools in Connecticut and Rhode Island, in which capacity his labors were of much use in improving the public school system of the country. In later years Dr. Barnard has been president of two different colleges, and also U. S. Commissioner of Education. The work by which he is best known among educators,

however, is his *American Journal of Education*, of which thirty-one volumes have been published. This work, as Mr. Monroe remarks, "is not a school journal or review in the accepted use of those words, but * * * a vast encyclopædia of educational literature." It treats of every aspect of education, and its reputation among educators is very high. Besides these various books about the history and theory of education, Mr. Bardeen has lately published "The Limited Speller," by Henry R. Sanford, comprising an alphabetical list of such ordinary words as are liable to be misspelt, with such directions for pronunciation as are deemed necessary.

—Cyrus W. Bardeen, of Syracuse, has issued a reprint of a work on "Education and Educators," by David Kay, which was published in England some ten years ago. The book contains nothing specially fresh or original, but it is sensible, and sets forth most of the fundamental requisites of education clearly and well. The end and aim of education, according to Mr. Kay, is the perfection of man; but his ideas of perfection are somewhat utilitarian in character, for he also holds that he is the best educated man who is best fitted for the duties he may be called upon to discharge. He points out the necessity of exercising all the faculties as the only means to their development; but thinks this exercise is best obtained in the acquisition of useful knowledge. He lays special stress on the need of moral training, and devotes a whole chapter to the relation of education to religion. In the chapter on the different kinds of educators, the author points out how large a portion of our education comes from the circumstances in which we are placed and from the persons whom we come in contact with in the early years of life; and he also dwells with earnestness on the duties of the mother as the chief educator of the child. On the special subject of school education Mr. Kay says but little, his whole work being devoted to the principles of education rather than to their practical application. The most peculiar feature of the book, and in the author's opinion the most valuable, is the abundance of foot-notes, consisting of quotations from a great variety of authors on all the subjects touched upon in the book, and containing at least twice as much matter as the text itself. The selections, though quite short, are well made, and will furnish much food for thought to the thoughtful and diligent reader.

—Along the line of activities in scientific knowledge mention may be made of the Isaac Lea Conchological Chapter of the Agassiz Association. This was the first society formed in the United States for the study of conchology and malacology, having no place of meeting, nor course of lectures, but depending entirely upon correspondence. Yearly reports of work done by the members are required, and these reports form the "Transactions" of the chapter. Four volumes of transactions have been issued in manuscript. The chapter is composed of members from the Atlantic to the Pacific Ocean. Many of these members are well known as conchologists. Members correspond with one another, exchange specimens and help each other in scientific work. The chapter is divided into biological and geographical sections for the study of land, fresh water and marine shells. It also has a section for the study of fossil shells. A juvenile section has recently been added to the society which promises to be an important feature. It hopes soon to have a good working microscopical section for the study of odontophores or radula of mollusks, as well as microscopic shells. There is no admission fee, and the merely nominal sum of fifty cents covers the annual dues. Applicants for membership should address the President, Prof. Josiah Keep, author of "West Coast Shells," Mills College, California, or Mrs. Burton Williamson, General Secretary, University, Los Angeles County, California.

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Attention is called to the "Wants" column. It is invaluable to those who use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

SOME RECENT ECONOMIC AND SCIENTIFIC QUESTIONS IN ORNITHOLOGY.*

BY R. W. SHUFELDT, M. D., WASHINGTON, D. C.

ORNITHOLOGY has attained to a status to-day never before reached by that science at any time within the recollection of man, or as shown by its literature.

In this country its cultivation not only interests thousands of amateurs, but its pursuit is followed by a host of eager experts, while its economic value has not altogether been overlooked by the government, which annually makes an appropriation in support of a department dealing with ornithological questions as related to agriculture. Regarded as the science is, then, from so many varied standpoints, it is not at all surprising that we find the collecting of birds actively undertaken for a great variety of purposes. Some of these are perfectly justifiable and fall strictly within the demands of the science and are essential to its progress, while others lie more or less without the pale of any such need, and consequently are deserving of our most energetic condemnation or prosecution. Thousands of birds are destroyed every year as a mere matter of sport, and either no use made of them whatever, or none worthy of mention. In this category, of course, I do not include the killing of game-birds for the table, a privilege that can be properly restricted legally, although it is very frequently more than abused. Many native birds are annually trapped for cages, and a large proportion of them perish. Quantities are destroyed by "feather-hunters" to supply the demands of fashion. Numbers are killed by ignorant farm-hands, who labor under the impression that they do humanity a direct benefit every time they take the life of a king-bird, a martin, or a marsh-hawk.

Then there are a few taxidermists who habitually destroy birds as a business, to preserve their skins and mount them for sale. As a rule, however, taxidermists are engaged only in the preservation of such birds as are brought to them, or else pursue their profession in scientific educational institutions or elsewhere.

Next we meet with every grade of amateur and scientific collector of bird-skins, who claim each year a certain proportion of specimens for scientific or semi-scientific purposes. In nature, also, some species prey upon others and thousands are thus annually destroyed, while every season the lives of millions of others are claimed by

storms, high winds and downpours of heavy rain. Certain predatory mammals capture others, or reptiles devour their young. No doubt, finally, that diseases, injuries and accidents take away their annual quota, but the proportion thus destroyed must, in comparison with other causes of mortality, be exceedingly small.

Now for a number of years past it has been widely noticed that in the suburban districts of many cities all over the United States, there has been a more or less marked decrease in numbers of many of our native birds, as, for example, orioles, robins, blue-birds and many other species. Frequently such reports are only too well founded in fact, while in other cases they have been over-rated. Certain it is, nevertheless, that within the last twenty years birds in the most of such localities have been becoming more and more scarce, while in some places where certain species were formerly abundant, those very species are practically now almost extinct. Numerous inquiries, scientific and otherwise, have been made with the view of finding out, if possible, the cause or causes which are accountable for bringing about this very undesirable state of things. After more or less mature deliberation some attributed it to one cause, some to another, and some to a combination of causes. Many were disposed to believe that the introduction of the English sparrow lay at the bottom of the whole trouble; in the eyes of some the "feather-venders" had all to do with it, while from other quarters the blame was attached entirely to the taxidermists and the bird collectors. As far as the writer has seen or heard not much importance has ever been attached to any other cause as a means of destruction of bird life, with perhaps the exception of the introduction of large lighting apparatuses in many places, where no doubt thousands of birds at night are yearly destroyed.

For more reasons than one the introduction of the English sparrow into this country was an expensive blunder, but that they are chiefly responsible for the disappearance of many of our native species of birds in the localities we have mentioned, I never have in that view been a firm believer, and my faith is not increased as time goes by. In the first place, it directly militates against every personal observation I have ever made in the premises, and I have faithfully studied the species for many years. Many of our native birds whip the English sparrow in each and all contests where they come in contact, and drive them out of the nesting places. They almost invariably give way before robins, cat-birds, wrens, martins and many others. Blue-birds appear to be more timid and gentle, and they simply keep out of the sparrow's way and make no attempt to oppose him, while on three or four occasions last spring I have seen the common house wren deliberately hustle sparrows out of a bird-box, where they had bred the season before, and re-occupy it themselves.

That the indiscriminate slaughter of small birds for millinery purposes, by conscience-ridden dealers, was for a long time a prime cause has been proven beyond cavil, and such people should simply be prosecuted by all the rigor of the law, and made to desist quite as promptly as that party who would commit any act that threatened the agricultural interests of the country, for no one will question for a moment but what the removal of our insectivorous birds does that very thing. Were all the birds in the country destroyed there is no power known to man that could check the enormous increase in insect life or the destruction of plant-life that would follow as a consequence. Such a wholesale disturbance of Nature's balance will not occur; while on the other hand I am not prepared to say whether the recent known decrease in our birds in certain localities has been followed by a cor-

*Read at the World's Congress Auxiliary of the World's Columbian Exposition:—Division of Ornithology. October 18-27, 1893.

responding increase of any particular species of noxious insects. That is a point for the entomologist to decide for us.

What comparatively few birds are gathered in for scientific purposes, I am strongly of the opinion, has but very little influence either one way or the other upon bird increase or decrease. Take a city like Chicago, for example, and its extreme suburban environs; how few, indeed, in proportion to her population, are there of her inhabitants who collect in the neighborhood birds for scientific purposes! In the course of a collecting season how many young scientific ornithologists in Chicago go out into her suburbs to collect birds? Not in any sufficient numbers, I warrant, to have any material effect upon the decrease of native birds. The same suggestion is applicable to other large towns and cities in the United States and Territories. When one comes to think of the millions of birds that pass over the country during the vernal or autumnal migrations *every year*, and then come to compare that host with all that has been deducted from it during the last century, as represented by all the birds actually existing in scientific collections, the loss is hardly worthy of mention. Moreover, more than half of our scientific avian collectors do not collect in the suburban districts but go far from the habitations of men, and so their work cannot be said to affect the question at all.

But there is a cause in my opinion, however, for the scarcity of our native birds in and about cities and large towns of this country, before which all other reasons we have mentioned stand absolutely aghast. It is the wholesale destruction carried on by the army of unscrupulous small boys in any particular place. I am the more convinced of this from my observations in and about Washington, D. C., during the past four years. This active destruction has been made possible by the numerous comparatively recent and cheap inventions in the way of air and spring-guns, as well as cheap rifles of small calibre, also other fatal contrivances that will noiselessly throw missiles of a variety of kinds with great accuracy. Hundreds of those guns are sold annually to boys, and the latter never seem to tire of strolling about orchards and hedge-rows and knocking over dozens upon dozens of birds with them. One day last spring I met one such youngster, and upon examining his game-bag found it absolutely crammed full of dead birds which he had killed since starting out in the morning. One item alone consisted of seventy-two ruby and golden-crowned kinglets. The same fellow boasted of having slain over one hundred cat-birds that season. Boys get to be wonderfully expert shots with the kind of guns to which I refer, and as the ammunition costs little or nothing, and a great quantity can be carried at a time, it is easy to be seen that between the wholesale slaughter they can and do commit, in addition to keeping the remaining birds perpetually alarmed, it is no wonder that they are soon driven away from the neighborhood of our cities and country seats.

There are ample legal measures within our power to enforce, to prevent this cause of bird decrease, especially if the fathers of those boys are held responsible, and I would suggest that it be the sense of this congress that such measures will be recommended to the various State legislatures hereafter that will have the tendency to thoroughly discourage such practices.

A NEW THERMOELECTRIC PHENOMENON.

BY W. HUEY STEELE, M. A., MELBOURNE UNIVERSITY.

It is stated in many text-books, and pretty generally known, that electric currents may be produced by heating

a single metal, if there be any variation in temper, or if the distribution of heat be very irregular and the changes of temperature abrupt. These effects are generally supposed to be exceedingly small compared with ordinary thermoelectric effects, but some experiments performed by the writer in the Physical Laboratory of the University of Melbourne show that at high temperatures these effects are sometimes exceedingly large, as great or greater than that given by a junction of antimony and bismuth at the same temperature. At low temperatures this is most apparent in iron wires, iron being the only metal in which I could observe the effect at a temperature below 100°C. If a piece of iron wire be put in circuit with a very sensitive galvanometer and gently heated irregular currents will flow, sometimes one way, sometimes the other, rising and falling in an apparently arbitrary manner. I several times observed the effect simply by warming the wire with my fingers. At a red heat the effect is much more marked and also much more irregular. The effect in iron, however, is not so great as in some other metals at a high temperature, the highest effect I observed in it being .002 volt. Altogether twelve different metals and four alloys were examined and the effect noticed in each of them. In order to raise them to a high temperature without breaking circuit by their fusing I put them through clay tubes (tobacco pipe stems), and when examining metals with low melting points I completely filled up the tube with the metal. A tube of lead when heated gave, after a little irregular heating, .3 volt, and another, with a lead wire passed through it and heated about the middle, gave about half that amount, but in this case there was no irregular or unsymmetrical heating. The effects are not always steady, in fact they very seldom keep steady, but they may be observed with certainty by filling a tube with lead and raising it to a red heat in a Bunsen flame. The effect may also be observed very easily in fine gold wire, but it does not last so long as that in lead, which shows no sign of ceasing after an hour's or half a day's heating. With gold I observed a higher effect than with any other metal, once observing nearly half a volt. .3 volt was observed with six different metals—lead, copper, gold, tin, zinc and antimony, while, with others, *e. g.*, silver and aluminum, though I could certainly observe the effect, it was exceedingly small. Sometimes when a metal is heated thus the changes in the electromotive force generated are slow and gradual and at times scarcely perceptible, while at others they are rapid and sometimes apparently instantaneous at a time when the temperature is perfectly steady and nothing is apparent which could cause the changes. Another curious effect is that sometimes when the temperature is falling, after the gas has been turned down or put out, there are rises, generally sudden, in the *e. m. f.*, this was chiefly noticed in lead. These phenomena are generally quite sufficient to mask the ordinary thermoelectric effect at a red heat, and thermoelectric tables are consequently quite unreliable for high temperatures.

CURRENT NOTES ON ANTHROPOLOGY.—NO. XXXIV.

(Edited by D. G. Brinton, M. D., LL.D., D.Sc.)

BASTIAN ON BUDDHISM AND THE PLACE OF DEPARTED SOULS.

RELIGIONS, like all other expressions of human intelligence, will ultimately come under a rigid scientific examination at the hands of anthropologists, and the laws of their growth and change will be determined without respect to the clamors of their votaries. Of all religions, that which certainly occupies the most territory in the Old World and perhaps has the greatest number of believers is Buddhism. It has recently attracted the attention of several of the ethnologists of Europe, among them

Dr. A. Bastian, the eminent Director of the Museum of Ethnology in Berlin, who has made it the subject of a lecture (*Der Buddhismus als religions Philosophisches System; Berlin, 1893*). As he but recently returned from the Orient, where he had unusual opportunities to study this faith in situ, his opinions are as fresh as they are profound.

Another of his lectures, published like the former with considerable additions, is upon the notions which have prevailed the world over as to the place of departed souls (*Die Verbleibs-orte der Abgeschiedenen Seele*). It illustrates with curious richness of learning the endless variety of the pictures the living have drawn concerning the fate of the soul after its departure from the body, some of the crudest being by no means confined to savage tribes.

Both lectures witness to the astonishing erudition of the author; but it is to be regretted that his style offers such difficulties to the foreign reader, and that his system of references is so vague.

CENTRAL AMERICAN ETHNOGRAPHY.

Geographically, Central America should be held to include all the area between the isthmus of Tehuantepec and that of Panama. Using the term in this sense, I believe that no new linguistic stock remains to be discovered there; though, it is true, of some we have very little material, and of a few tribes we have not positive knowledge. The most important of these is the Guetares or Huetares, who lived near Cartago in Costa Rica, and who seem now to be extinct. Señor M. de Peralta prepared in connection with the Madrid exposition an excellent resumé of the ethnography of that state, and this was the only problem he left unsolved (*Etnografía de la Republica de Costa Rica, Madrid, 1893*).

Recently, Dr. C. Sapper, of Guatemala, wrote to me that he had found an unclassified tongue spoken by a few old people at Tapachula, in Chiapas, close to the western boundary of Guatemala. At my request he kindly sent me a short vocabulary; but he himself had already by that time noted its resemblance to the Zoque-Mixe family, of which it unquestionably is a member, though the presence of this stock in that part of the map had not previously been noted.

There is a very prevalent error that the Caribs had settlements in Central America. I observe it in the notes to Quaritch's edition of the voyages of Americo Vespucci, and elsewhere. It is certain they had not. No Carib dialect has been found anywhere above the isthmus of Panama. The Caribs of Honduras and Belize have been brought there since the conquest.

ANTHROPOLOGY IN THE UNITED STATES SEEN WITH FRENCH EYES.

Last spring Dr. Paul Topinard, the well-known editor of *L'Anthropologie*, made a rapid tour over the United States, and on his return promptly gave his readers his scientific "impressions de voyage" under the title "*L'Anthropologie aux Etats Unis*".

He considers first the domain of physical anthropology, to which he assigns a rather erroneous history. It is totally misleading to say Aitken Meigs (whose name he spells *Miegg*) "continued Morton"; the fact being that he reversed Morton's most important deductions. It is equally erroneous to date the study of the ethnography of the native race of the United States from the organization of the Bureau of Ethnology in 1879. Long before that, the labors of Gallatin had laid a broad foundation, on which many solid superstructures had been erected. More amusing is the reference to the serpent-mound of Ohio as "discovered by Mr. Putnam", which indicates that Professor Topinard had looked more at our collections than our libraries; though he does mention the work of Squier and Davis, assigning its publication, however, a wrong date, 1840, instead of 1848.

M. Topinard writes at considerable length on the palæ-

olithic question in American archæology, and on the origin of the American race. He seems inclined himself to believe that the American race, like Topsy, "just grewed" here, and later became more or less modified by immigrations from Asia. He is, therefore, perfectly willing to accept the discoveries of implements in the Trenton gravels as palæolithic, and immediately post-glacial, if not glacial; but considers them far ante-dated by those obtained by Dr. Hilborne T. Cresson from the Columbian gravels near Claymont; "but," he exclaims, "while the glory of this proof remains with Mr. Cresson, it does not diminish that of Dr. Abbott, who remains the Boucher de Perthes of North America!". In the "fight", therefore, over palæoliths, "rejects", and the like, our visitingscientist sides with Messrs. Wilson, Putnam, Wright and Abbot, and affiliates not with the camp of the enemy.

It is a pity that the Professor, who came over to see the Chicago Exposition, departed before the opening of the Anthropological Department; and that he did not remain to the meetings of the American Association at Madison and the Congress of Anthropologists at Chicago. It is likely that he would have materially modified much that he has written, had such been the case.

A CONTRIBUTION TO PERUVIAN MYTHOLOGY.

One of the most interesting fragments of the ancient mythology of Peru is that preserved by a native, Joan de Santa Cruz Pachacuti, with reference to the hero-god Tonapa. Though written early, it was first published at Madrid in 1879. The author was more fluent in his native Kechua than in Spanish, and his construction is often awkward. In some paragraphs he inserts the original prayers and invocations without translations, and when he does give these, his knowledge of Spanish was too limited to be accurate.

In a work published some years ago ("American Hero-Myths") I analyzed this myth, and reached the conclusion that it belonged to the cyclus so common among native American tribes which describes the advent of the fair-hued light god, and the benefits which he brings to his people. Last year, without knowledge of my previous study, Sr. S. A. Lafone-Quevedo of the Argentine Republic, published a very thorough examination of the story in the *Revista del Museo de la Plata*, under the title "*El Culto de Tonapa*"; and I am glad to say, reached substantially the same conclusions. He also adds full and careful translations of the Kechua prayers and chants in Pachacuti's narrative, having had the advantage of the assistance of Sr. Mossi, cura of a parish among the Kechuas, and thoroughly familiar with their tongue.

He also is inclined to the belief that the myth of the Tonapa, along with many of the rites connected with it, may have been borrowed by the Kechuas from the Aymaras; in which he coincides with what I had expressed. But in his endeavors to trace a linguistic connection of "Tonapa" with the Nahuatl "Tonatiuh", and of the "Con" of the Kechuas, an important divinity, with the "Canob" of the Mayas of Yucatan, he is certainly led astray by mere phonetic resemblances which mean absolutely nothing. There is not the slightest evidence either in language, history or archæology, that the great Peruvian culture of the south either borrowed from, or loaned to, that of Central America. They appear to have been wholly independent centres of civilization.

—Dr. J. Christian Bay has resigned his position at the Missouri Botanical Gardens, St. Louis, Mo., and accepted the position of bacteriologist of the State Board of Health, Ames, Ia.

—Oscar Clute, M. S., LL.D., resigned his position of president of Michigan Agricultural College and Director of Agricultural Experiment Station to take the same position in the Florida Agricultural College Sept. 5, 1893.

IMPROVEMENTS IN THE STORAGE OF ELECTRICITY.

BY F. H. BOWMAN, D. SC., F. R. S. EDIN., M. INST. E. E., AND ASSOC. INSTS., C. E. AND M. E., ETC. BOWDON, ENGLAND.

It is only within a comparatively recent period that electricity has taken a foremost position for lighting, motive power and general use in chemico-metallurgical operations; still the very great advances which have been made and which are continually in progress have rendered it certain that electricity is the agent of the future, and that the part which it will play in the industrial economy of the world will ever be an increasingly useful and advantageous one. The discovery of the principles of the dynamo by Faraday, and its working out into actual practice by a long series of able inventors, have dispensed with the old and cumbersome methods of the generation of electricity by chemical means, and rendered its production a simple and thoroughly reliable process.

Notwithstanding this, however, the energy is essentially a dynamical one, and the continuance of the current is entirely dependent on the continuous motion of the generating machinery; and hence, whenever the machine stops, the current stops with it. More than this, any fluctuation in the regularity of the power supplied to drive the dynamo produces a more than corresponding fluctuation in the quantity and intensity of the current; and hence it is necessary to have all the parts of the generating machinery duplicated, which increases the expense of the production of the current. Water power can be stored in reservoirs so that the winter's rain may be made available for summer's drought, and a constant flow of water thus obtained. Gas, which is generated intermittently in retorts, can be stored in suitable holders, and delivered out in regulated quantities throughout any given number of hours; and until it was possible also to store electricity the economical use of it was somewhat restricted, or perhaps it would be better to say that the possibility of its application to a larger number of cases and with more perfect regularity was secured by the method of electrical storage.

It had been noticed in certain experiments with primary chemical batteries that if a current from a battery was sent into another cell, the two elements of which were lead plates in an acid solution, a portion of this energy could be stored up in the elements of this cell, so that when the current was cut off from the charging battery and a connection between the plates of the charged battery completed, a current was obtainable, but flowing in an opposite direction from that in which it had entered the charged battery. This charged battery had its efficiency very much increased by being continuously charged and discharged when the currents sent into it were not so strong as to destroy these effects. The difference, therefore, between a primary battery and an accumulator may be simply stated as follows: In the primary battery the two plates are made of different materials, such as zinc and copper or zinc and platinum, and a current is generated by chemical action upon one of these plates, the other remaining unaffected; whereas in the accumulator both plates are of the same material, namely, lead; and neither of them wastes with the action of the current, the current derived, when the connection is made, being entirely due to the chemical action which has been set up in these plates by the current which was sent into them. It was soon found that, by a proper modification of the elements of the accumulator, the capacity to store the energy could be largely increased, and could also be retained for a considerable period of time without loss. Since the days of Ritter, Planté and Faure, to whom we owe the primary

discoveries, very great improvements have been made in these accumulators. The early accumulators, like the early dynamos, were very ineffectual machines, very liable to get out of order, and easily destroyed by local action, and they were very irregular in their power to retain the electric energy; but the improvements which have been introduced into them have done away with many of these difficulties, and the most modern accumulators have an efficiency which but a few years ago would have been considered absolutely impossible.

The earliest form of practical accumulator was devised by Planté, and consisted of two thin sheets of lead, which were separated from each other by a piece of flannel of the same size as the plates. These plates were rolled round in a cylindrical form so as to occupy the least possible space, and then placed in a jar or other suitable vessel containing dilute sulphuric acid. The plates were charged by connecting them respectively with the two poles of a dynamo. The current from the dynamo decomposed the acidulated water, and oxygen was accumulated on one of the plates, and thus a store of chemical energy was provided which could be expended in the generation of an electric current when the charging was complete. The oxygen attached itself to the plate by entering into combination with the lead, thus forming a lead oxide, and the action on the other plate was to remove any oxygen which might be accumulated on the surface of that plate in the form of oxide, and reduce it to a pure metallic form. It will thus be seen that the electric current from the dynamo had accomplished work by tearing asunder the atoms of the acidulated water in which the plates of the accumulator were immersed and storing up the oxygen in combination with the material of one of the plates. A chemical strain is thus induced between the two plates, which increases in intensity as long as the charging current is sent into the accumulator until a certain point is reached, which point is that at which the whole of the available surface of the oxidized plate has been completely changed into the lead oxide. After that the oxygen is given off from the surface of the plate, and no further storage takes place. When the charging current is taken off and the two poles of the accumulator reconnected, the strain tends to equalize itself, a portion of the oxygen from the oxidized plate passing by electrolytic action to the unoxidized plate until complete chemical equilibrium is restored, when the action ceases. When this process is continued for a length of time, which is necessary, in order that an efficient accumulator may be obtained, this alternate oxidizing and deoxidizing causes the surface of the plates to become more porous, or spongy, and thus it presents a larger surface to the oxidizing agent than would otherwise be the case; and at the same time, the surface of the lead being in a more granular or finer state of division, the alternate oxidation and deoxidization takes place with greater ease and rapidity, and thus not only is the quantity of energy which can be stored greater, but the time required for charging and discharging becomes less. This is a most important matter, because it not only enables a smaller number of cells to be used for the storage of a given quantity of electricity, but it also enables that which is drawn out to be obtained at a more rapid rate, since it is found that the power to receive the charging and to give it out are almost proportional.

The formation of this spongy surface on the plates of the accumulator by the alternating action of an electric current extends over a considerable period of time, and is a most expensive process, because it requires a large expenditure of electric energy to extend the spongy surface to any depth in the plates. To get over this difficulty in the more modern forms of the accumulator, devices

were employed to obtain this sensitized surface in a more efficient and cheaper manner, such as dipping plates in oxidizing acids so as to chemically prepare the surface, scoring the plates, corrugating them, or giving them star-like or other sections, so as to present a larger surface for the same weight, filling perforated cylinders or other hollow forms with finely divided lead. The greatest advance, however, was made when it was discovered that by punching holes in the plates so as to give them the form of a collander and filling them up with an acid paste of red lead, or, better still, casting the plates in the form of a grid or grate and filling up the holes in the grid with an acid mixture of red lead for the positive plate and lithage, which is a lower oxide of lead, for the negative plate, plates in this form required much less forming and a much shorter time to charge, retained their charge for a longer period and gave out their discharge with greater regularity and in larger volume. This marked a distinct advance in the storage of electricity, and in the various forms of accumulators which are constructed in this manner very reliable and efficient results have been produced.

They have, however, one disadvantage: if they are either charged or discharged too rapidly a disintegration of the surface of the sensitised portions of the plate occurs. It probably arises from this cause. The acid paste of lead oxide consists of a mechanical aggregation of molecules of lead oxide, which are neither perfectly homogeneous in their structure nor perfectly regular in the arrangement of the molecules. The interstices between the molecules, from the very nature of the irregularity in the mechanical structure, must also be irregular. When, therefore, either in the charging or discharging, there is an evolution of gas in the interstices of the sensitised portion of the plate, especially at the surface, the increase in volume by the change of the liquid portion of the electrolyte into the gaseous form throws a pressure within the interior of the molecular mass; and, in consequence of the irregularity in the interstices, these gaseous streams conflict with each other, and hence portions of the surface of the plate are disintegrated and fall down into the bottom of the cells. When the current, either in charging or discharging, is small in quantity, this disadvantage does not appear in the same proportion as when the charge or discharge is great. In actual use also it is generally desirable to draw out the stored energy at a greater rate than to charge it, so that the accumulator during the period of charging is usually subjected to a much less strain than during the period of discharge. When, therefore, the charge requires to be drawn out very quickly, the plates suffer rapid deterioration, and this rapid deterioration very soon breaks up the sensitized portions of the plates, and, by causing unequal expansion and contraction, causes buckling and local action.

This is one of the greatest disadvantages which this form of accumulator possesses, and it is this fault which has rendered them, not only in inexperienced hands, very inefficient, but also very costly to maintain. The most modern form of accumulator to-day has now almost entirely done away with this disadvantage. It is well known that in a crystalline form the molecules of matter are arranged in a different order from what they are in any mechanical mixture. In the mechanical mixture the aggregation of the atoms is strictly fortuitous, that is to say, it is a mere question of chance how they are arranged, and they have no cohesion amongst themselves beyond that which is given to them by the cementing mixture which holds them together. In the crystalline form, however, all this is changed; the molecules of the body are arranged in perfect symmetrical order, and they are held together by molecular affinities which regulate the order of their distribution and secure the coherence of the mass. It is

quite true that the material is denser unless some means are employed to modify the density; but although this is the case, the molecular channels which exist in the interstices of the crystal are arranged in as regular order as the molecules of the crystals themselves. This property has recently been employed with very great success in the formation of accumulators, and has enabled the plates of which they are composed to have the greatest uniformity in structure, capacity in storage, rapidity in charging, and regularity in discharging. While all these objects have been obtained, it has been found, in addition, that there is a greater durability in the life of the accumulator and a greater power to retain the intensity of the voltage almost to the end of the discharge.

The active part of the plates is formed of chemically pure lead, which is obtained in the following manner: White chloride of lead, after being thoroughly washed and dried, is mixed with a certain portion of chloride of zinc. The proportion varies with the use to which the accumulators are to be put, as upon this mixture depends the degree of density or porosity of the reduced lead, and this method of manufacture secures a most complete control over the structure of the plates. The mixture of lead and zinc chlorides is then fused together into a molten state, and cast in blocks like small tiles in suitable moulds. The size and thickness of these tiles depend on the purpose to which the accumulators are to be put. The form of the tile also varies with the particular form and size of which the plates of the accumulator are to be made. These chloride squares are then placed in a bath of dilute hydrochloric acid, which removes all the chloride of zinc. They are then dried and placed in suitable moulds to receive the framework of lead into which they are cast. The plates of lead enclosing the tiles of dried lead chloride are then placed in a dilute solution of chloride of zinc along with alternate plates of zinc, and, a connection being made between these plates, an electric couple is obtained. The lead chloride in the tiles is thus reduced to a pure porous metallic lead. If a section is made of one of these chloride tiles which has thus been reduced to pure porous metallic lead, it is found that the direction of the pores is always at right angles to the surface of the plate, and this structure, therefore, enables the electrolyte with which the accumulator has been formed to penetrate every portion of the porous lead, and the structure also offers very little resistance to the disengagement of the gas which is formed by the electrolytic decomposition; and thus there is no tendency to disintegration of the plate, because no pressure is thrown upon the molecular structure. In the first formation of these plates those which are intended for cathodes or negatives and those which are intended for anodes or positives are all treated alike; but it is found better to again treat those plates which are intended for positives in a further manner by placing them along with alternate plates of lead in acidulated water and exposing them to the action of a current of electricity which is sent into them from a dynamo. By these means a reduction of the lead is more completely performed, and the greatest efficiency of the accumulator secured. The formed plates can then be built up alternately with the negative plates into any size of accumulator which is required.

The construction of this type of accumulator has solved many of the difficulties hitherto experienced. It has produced an accumulator with every quality which is most desirable, viz., a high rate of charge and discharge without injury to the plate, a high capacity of storage, and the maintenance of the voltage through a very large percentage of the capacity. Along with this there is also a very greatly increased durability; and the fact that the same number of ampere hours can be stored in half the weight

of plates as against every other previous system not only makes their introduction a distinct era in electrical science, but opens up an increasingly wide field for their use in every-day life. As accumulators built in this form have been working, notably in Paris, for several years, their durability and efficiency are placed beyond doubt. Not only will they be of the greatest service in connection with electric lighting installations, but their high efficiency and light weight render it probable that sooner or later, in some form or other, they will render electric traction over ordinary roads not only a possibility, but a commercial success. It is probable that along the lines of this discovery still further improvements may be made, and each step in advance will probably open up increasingly wide fields for electrical application.

LETTERS TO THE EDITOR.

* * Correspondents are requested to be as brief as possible. The writer's name is in all cases required as a proof of good faith.

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

THE SYSTEMATIC POSITION OF DIPTERA.

IN connection with the discussion that has been had on this subject in the columns of *Science*, Prof. John B. Smith has suggested that I send you some ideas of my own, as expounded in a lecture before the Brooklyn Institute last February, which was substantially the same as one previously given before the Lowell Institute at Boston, in January, 1892. It was on the general subject of social insects, and after showing that the insects treated were among the more intelligent of the insect world, I concluded with a statement of my own views as to the nature of this intelligence, and urged that we can never properly appreciate or bring ourselves into sympathy with lower creatures until we recognize that they are actuated by the same kind of intelligence as we ourselves. I drew attention to the significant fact that, just as among the mammalia, the higher intellectual development, as in man, is found physiologically correlated with the longest period of dependent infancy, and that this helpless infancy has been, in fact, a prime influence in the origin, through family, clan, tribe and state, of organized civilization; so in the insect world we find the same physiological correlation between the higher intelligence and dependent infancy, and are justified in concluding that the latter is in the same way physiologically correlated with brain development, and, at the same time, the cause of the high organization and division of labor. I then alluded to the discussion as to the systematic position of the different orders of insects, and especially to the claims that had been made for the Diptera as being of the highest rank. I argued that such claims were not justified, and pleaded for the Hymenoptera, not only on some of the grounds indicated by Dr. Packard, but particularly on the ground that the highest degree of intelligence among insects is exhibited by the social species in this order. There is a great deal that is vague and unmeaning in the discussion as to what is "high" or "low" in the relations of organisms to each other. If specialization of external structural parts is to be looked upon as an index of high position, then very many animals must be admitted to outrank man, whose bodily characteristics are in many respects embryological and non-specialized; while the parasitic forms among insects would have to be placed among the very highest, since, in a majority of instances, they exhibit the most perfect adaptations and specializations.

Yet these last are almost universally admitted to be degraded forms, while few men will willingly allow that the genus *Homo* does not stand at the apex of the mammalian class. His superiority, however, is just as uniformly conceded to be by virtue of his intellect.

In the same way I urged that the order Hymenoptera, containing, as it does, the more highly developed social and intelligent insects, should, by virtue of these facts, rank above all other orders. This question of rank is meaningless, except as an indication of relative complexity of structure, the organisms best deserving to be ranked above all others in development being those which have acquired the greatest complexity. Nor must this complexity be confined to mere external structure, but must include nervous organization and brain development—in other words, must include psychical as well as physical characteristics. There is probably no more complex animal organ than the human brain, just as among insects there is probably no more complex hexapod organ than the brain of the ant or of the bee.

Such are substantially the ideas I set forth, the plea being that intelligence should no more be omitted from any discussion of the question of development or rank among insects than among vertebrates.

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Washington, D. C.

BOOK-REVIEWS.

Vagaries of Sanitary Science. By F. L. DIBBLE, M. D. Philadelphia, J. B. Lippincott Company. 462 p., 8 vo.

IMPRESSED with the imperfections, misstatements and inconsistencies of vital statistics in general, and of the reports of boards of health in particular, the author of the above-named work undertook a systematic study of Sanitary Science as practised by its votaries, and from being a believer in the same he has become a bitter antagonist, raising a protest most bitter in tone against all the accepted rulings. The book is outrageous in its sweeping challenge of cleanliness, and the author has certainly laid himself open to criticism in his championship of dirt and filth; but yet there is a certain well defined point of value in that it sounds a note of caution at a time when we are all rushing headlong into an unscientific acceptance of sanitary promulgations. Attention, too, is called to the character of the men who have taken up this branch of work, and, though the general statements are a slur upon the many earnest and scientific workers, still the statements are too often true of the members of many of our city boards.

The origin of the movement is described in the "Introductory" chapter as "a kind of disorderly agitation that suddenly seized the people of Great Britain following an inquiry into the condition and manners of living of the poorer classes of that country." In our own country the origin is ascribed "more to a fondness and habit of imitating the English than to any other cause." The movement is likened to a fanatical religious awakening, and the science to a false religion, whose priests have held whole continents in terror, and who, to gain stability, persistently summon up some new danger to frighten the people, and then caress them into tranquility by the announcement of their discovery of the antidote. The book is recommended by the author—"not for those of life-long prejudice, or who fear to sink into depravity in listening to the innocence of nature's metamorphosis, but for those timid people who have been plagued for the past thirty years by the increasing procession of sanitary terrors, and for those who love truth for truth's sake."

In chapter I, the history of "Sanitarians—Ancient,

Mediæval and Modern," is reviewed, and the law-giver of the Jews suffers not less than the modern inspector as he comes under the author's withering sarcasm. The birth of sanitary science in the great sanitary awakening is then described. The next four chapters are devoted to "the tripod on which sanitary science rests"—air, water and soil. The general arrangement of these chapters, as of others throughout the book, is: to first introduce the subject with general remarks; second, to repeat numerous cases where disease has been supposed to originate in filth, then to analyze these cases, expose their feebleness, and, finally, to close with an array of scientific experiments which tend to show that no connection whatever can have existed between this filth and the diseases presumed to have arisen therefrom. Most prominent among these scientists are: Flügge, Pettenkofer, Koch, Miquel, Karlinski, Kraus, Crookes, Tidy, Odling, and Hueppe. Water is attacked through the weakness of the chemical methods in vogue, and also in the fact that typhoid bacilli, etc., according to the testimony of a number of the writers above mentioned, flourish in pure and sterilized water, but quickly disappear in water contaminated with sewage and containing putrefactive bacteria. The same idea is worked out in the discussion of the air and soil. Sewer gas is described as the result of the earlier sanitary measures, and we have it now produced and laid in our houses. The triple alliance the reformers had made with the ladies and clergy was now reinforced by the plumber, who became the "sanitary plumber." Numerous cases are cited in towns, jails, etc., and among workmen employed in the sewers where the sewer gas failed to produce zymotic disease. The sewer gas doctrine is spoken of as "a pure creation, begotten in and floated from the sanitary brain without any investigation, it was, without any examination, accepted and devoutly cherished by almost the entire people, wise and simple, of Great Britain and America—a creation that from the first was viewed with contempt by scientific men of other countries. Pettenkofer said that it was as easy to show that infectious diseases had the same relations to lines of illuminating gas tubes and telegraph wires as to lines of sewers."

Cemeteries, "chronologically the first which the sanitarians erected to affright and torment the people about the health," forms the subject-matter of chapter VIII., with the same discussion as before and the same conclusions. The dangers supposed to lurk in diseased meats and in adulterated and contaminated milk are disposed of in two chapters, and then we have a discussion of filth and fecal diseases, typhoid fever, etc., yellow fever, cholera, and diphtheria. In the case of the first mentioned, typhoid, its parallel development with the sanitary reform is spoken of, the history of the disease is given, and, as before, numerous examples of imperfect identification of the cause. The chapter on cholera containing the testimony of Koch is interesting. A brief history of the world's greatest epidemics is followed by a scorching section on Boards of Health. Dr. Dibble holds "that in so far as they have directed their efforts and consumed their energies on subjects which have no influence on individual or public health, and in so far as they have diverted the attention of the people thereto, just so far have they retarded and obstructed true progress in that branch of medical science which is devoted to hygiene, and just so far they have been a positive detriment to the public health."

Dangerous as the book would undoubtedly be in the popular hand, to the thinking physician it sounds a note of warning, a call for scientific investigation in place of mute acceptance of sanitary rulings, for a superior board of health, and for experimental work. In short,

that as hygiene and sanitary science bid fair to play an important, if not the most important, part in our social economy, and to approach with their sister, Medicine, an exact science, that then, with the aid of the biologist, bacteriologist and chemist, these new sciences should rest upon a scientific basis. C. P.

Handbook of Greek and Latin Palæography. By EDWARD MAUNDE THOMPSON, D. C. L., LL.D., etc. New York, D. Appleton & Co. 1893. 343 p.

THIS volume of the International Scientific Series is designed especially to facilitate the study of the ancient manuscripts, rather than classical epigraphy, although it does not neglect the development of rustic writing and the majuscules. The first few chapters present a succinct and clear description of the accessories of ancient writing—as the tablets of wax or wood, and the paper, linen, clay, parchment or other surfaces on which it was to be placed; the pens, styles and inks which were employed, and the forms of the books, rolls or codices.

This preliminary matter supplied, the author turns to Greek palæography, explaining first the antiquity of the writing, and the forms of it as shown by various documents. Some of the oldest and most remarkable of these have been obtained at different times from Egypt, and carry us back about two centuries before the Christian era. From this date the characteristics of the Greek uncial and cursive hands are shown, down to a recent period. The remainder of the work is devoted to Latin palæography, from Roman times, through the Lombardic and Merovingian periods and the Middle Ages, and concluding with the Chancery hands, the Charter hands, and the Court hands.

A special feature of the book is the accurate presentation by photogravure of numerous specimens of the hands described, the tables of alphabets, and a useful list of palæographical works.

An Elementary Text-Book of Biology. By J. R. AINSWORTH DAVIS, B. A. Second Edition. London, Chas. Griffin & Co.

THE appearance of the second edition of this text-book is indication enough that its plan meets a general want among the people for whom it was designed. The purpose of the present book is to furnish a treatise on theoretical biology, which will serve as a general accompaniment to the various books on practical biology which have appeared from time to time. The author takes up a long series of types, first describing their morphology, then giving a more or less thorough discussion of the physiology of the type, and, lastly, of its development. These three methods of treatment, particularly the last two, make the present text-book one of the most comprehensive text-books in general biology that has appeared in the English language. The morphological part is full and complete, and the descriptions are well illustrated by figures. The sections on physiology and development form the unique feature of this method of teaching, and great praise should be given to the author for putting together in such brief compass the essential principles of theoretical biology. Throughout the book there is that liberal use of italics and full-faced type which aids so materially in making a book intelligible and drawing attention of the student and reader to the important as compared to the unimportant portions of the text. The book is also thoroughly illustrated by figures, most of which are very good and clear, but a few of which are extremely crude and poor. It is hardly possible for one to make much out of the figure describing the anatomy of the pigeon or the frog, and one regrets that the second edition has not seen some of these poor cuts replaced by better ones.

The new edition of the book is entirely rewritten and very much enlarged. So much larger has it been made

that it has been found necessary to divide it into two volumes, the first volume discussing the morphology and physiology of plants, and the second volume the morphology and physiology of animals. In addition to various changes and expansions in the text, many new types have been added in the second edition. The most important of these new types are *Vaucheria*, *Selaginella*, *Gregarina*, *Taenia*, *Ascaris*, *Hirudo*, *Anphioxus*, and chapters upon plant cells and tissues, upon fish, upon geographical distribution, and one chapter devoted to man. In the groups of flowering plants also there have been very many additions, so that the whole new edition is nearly twice as large as the original. Perhaps the most valuable additions that have been made in the new edition have been in the sections upon physiology and development. In nearly every case has the physiology of the types been rewritten and expanded, and this is true also of the sections on development. Several additional sections upon the subject of Cytology, including cell development, fertilization, etc., have been added bodily to the work.

This book on biology is excessively compact, and there is crowded within these two volumes an amount of information and discussion which is certainly beyond that which can be accomplished by classes in our institutions. The book is designed, however, especially for certain phases in English education, and not for education in our schools. It is supposed to be accompanied by laboratory work, and the author has hopes that it does not require the guidance of a teacher, but is in a form by which it can be readily followed without guidance. No laboratory directions are given, however, and the details crowded into the sections on morphology are so numerous that it seems hardly possible to hope that they can be comprehended without a very long course of study under the guidance of competent instructors. As a reference book, however, one cannot speak too highly of this text-book, and as a treatise in theoretical biology it occupies a place not filled by any other English publication.

An Examination of Weismannism. By GEORGE J. ROMANES. Chicago, Open Court Publishing Company.

ONE is always delighted to receive something new from the pen of Mr. Romanes, for he has demonstrated by many attempts his marvelous power of writing clear English and of taking abstruse subjects and dressing them in the fashion that makes them not only intelligible, but interesting to the ordinary reader. The little book here noted is published in anticipation of the second volume of "Darwin After Darwin," the publication of which we are awaiting. It seems a very surprising thing when one looks through the pages of this book, to find Weismannism discussed without a discussion of the subject of the inheritance of acquired characters, for so thoroughly has the inheritance of acquired characters come to be regarded as a part of Weismannism, that one wonders how the subject can be treated without it. But Mr. Romanes scarcely mentions this subject, reserving it, as he tells us, for discussion in his later book. The present discussion is simply a review of Weismannism as a theory of heredity and of evolution, and not as bearing upon the question of acquired characters. In this little work we are to thank Mr. Romanes especially for three features: First, the clear distinction that he has drawn between the Weismannism theory of heredity and his theory of evolution; second, a logical comparison of the heredity theory of Weismann with others somewhat allied to it, especially that of Galton; and third, for the skilful marshalling of the trenchant criticisms against Weismann's views, which have appeared in the discussions of the last few years,

and have led to great changes in Weismann's own opinions. We are also fortunate in having given us a historical view of the gradual growth of the theory as it developed in the mind of its author and of the final abandonment of some of the most essential features of the original view.

No word is needed in regard to the excellence of the English and the plainness of the discussion, for Mr. Romanes' writings always show the most clear logical arrangement. The reader of this work cannot fail to gain a more comprehensive view of the general theory of Weismannism and its relation to biological problems, and will appreciate from this discussion, better than from the writings of Weismann himself, the significance of the final position adopted by Weismann.

The Life of a Butterfly. By SAMUEL H. SCUDDER. New York, Henry Holt & Co. *Brief Guide to the Common Butterflies of Northern United States and Canada.* By SAMUEL H. SCUDDER. New York, Henry Holt & Co.

THE object of these two books by our leading student of butterflies in the East is to present certain facts in a familiar way for the use of the student who is as a novice interested in the study of nature. The first book, of 180 small pages, gives a familiar description of the life of our most common and best known butterfly, the so-called milkweed butterfly, presenting, in a familiar and popular style, a description of the animal, of its life-history, and its general relation to its surroundings and to science. The author uses the example, as a basis for a discussion of a few striking scientific laws, most interesting of which will be, to the ordinary reader, the study of the geographical distribution and migration of animals, the subject of mimicry as shown by insects, the subject of the power of vision possessed by insects, and a very clear, satisfactory illustration of certain phases of the general law of natural selection. The general design of the book is excellent, and the style is, on the whole, well adapted to the persons to whom the book will appeal. It is unfortunate that no figures are inserted in the text. A small number of figures are put in at the end of the book, but no reference is made to them in the body of the book, and, consequently, the reader will follow the book through without the proper study of the figures which should go with the text. Perhaps, also, the author has made too free a use of scientific names of species of butterflies to be intelligent to the ordinary reader; but, with these few points of criticism, "The Life of a Butterfly," by Mr. Scudder, is one of the interesting and instructive introductions to nature which our scientists are at the present time endeavoring to put within the reach of the non-scientific reader.

The second book is very different in its nature, and is designed to enable the student of butterflies to determine the names and learn of the habits of all of our common species of butterflies. The author has selected one hundred of the commoner forms for description. The introduction of the book gives a long, careful description of the anatomy of a butterfly; and here, even more, it is to be extremely regretted that no figures are introduced. It is so much easier for the beginner to study specimens by the aid of figures of reference that one must seriously regret the lack of the introduction of explanatory figures in the text which describes the structure and anatomy of a butterfly. The description is followed by a key for determining the species of butterflies, and this key is especially valuable, inasmuch as it not only enables the student to determine the species by the use of the adult butterfly, but also has separate keys for determining species by the use of the caterpillar and of the chrysalis. These two secondary keys

will make this little book of very much more value to the novice than any other attempt to accomplish a similar purpose. Something over one hundred pages are devoted to a description of one hundred of our commonest butterflies, including not only a description of the butterfly, caterpillar and chrysalis, but a general account of the eggs, the habits, feeding plants and distribution of the species, giving the student thus a brief but comprehensive account of our knowledge of each different species. An appendix, which is fortunately illustrated by figures, gives directions to the student for collecting, rearing, preserving and studying specimens.

The two books together form a very valuable introduction into the study of New England insect life.

Cholera: Its Causes, Symptoms, Pathology and Treatment.

By ROBERT S. BARTHLOW, M. D., LL.D. Philadelphia, Lea Bros. & Co.

THIS little book, of 125 pages, is quite opportune in its publication at the present time, when the civilized world is once more agitated over the subject of cholera, and when we are believing that we have succeeded in so mastering the disease as to make the epidemics of former times impossible. Dr. Bartholow writes from an experience of his own through two epidemics, and his words are therefore more authoritative than they might be from one with no personal experience. The book deals with the history of the disease, with the various epidemics that have invaded Europe and America during the present century, and gives, also, a brief account of cholera in this country. It considers carefully the causes of the disease, and accepts the comma bacillus as the existing cause, though recognizing a large factor in personal predisposition toward the disease. The relation of the disease to drinking water is very satisfactorily shown by study of several epidemics in the world, and the details of their distribution through drinking water. The latter part of the book is more strictly for the use of physicians, being an account of the symptoms and treatment of the disease. A chapter on methods of prevention will, perhaps, from its practical standpoint, be the most valuable to the general reader, inasmuch as it is through preventive remedies, rather than through the treatment of the disease, that we are hoping at the present time to be able to stop the spread of this once dreaded scourge. The book is timely, well written and interesting.

Analytical Keys to the Genera and Species of the Water Algæ and the Desmidiæ of the United States. By ALFRED C. STOKES. 1893. 177 pp. 1 pl. 8 vo.

THIS book has been prepared to serve as a key to the genera and species of Algæ and Desmids described in Rev. Francis Wolle's monographs of the two groups. In the introduction Dr. Stokes puts in a strong plea for artificial keys. He is aware that specialists usually look down upon such aids to a knowledge of their subjects, but he rightly thinks that the keys aid the beginner over the hard places in the new study. While the key can only enable one to find the name of an object, this name is what every one must find before he can begin any intelligible discussion concerning it. "The object," he says, "cannot be referred to by speech or in writing until its name is known. What other workers in other parts of the world may have said about it, or done with it, cannot be known until its name is learned, as without the name all indexes are closed in all the books in all the libraries. The name is the clue to further knowledge, its starting point, even the hook upon which further information is to be hung. Whatever advanced scientists may say to the contrary, their first effort—perhaps it is an unconscious one—but their first real effort is to ascertain the name of

their new specimen. If it has none, they at once proceed to give it one. All the wild talk about the desirability of learning the name is wrong in principle. The name is, as everyone will cheerfully admit, only of secondary importance when compared with a study of habits or morphology, but it is as essential, since it is, and ever must be, the starting point for further investigations, at least on the part of the amateur." So the author has put much time into the making of these artificial keys, and there is no reason for not thinking that they will serve an excellent purpose in showing the way into the labyrinth of the Algæ and Desmids of the United States. J. F. J.

Human Embryology. By CHARLES SEDGWICK MINOT. New York, William Wood & Co. 1892. 815 p.

WE are extensive compilers of medical works in this country, but are far behind both England and Germany in biological text-books. This important work, by Professor Charles Sedgwick Minot, of the Harvard University Medical School, is actually the first of its kind which can be compared favorably with many similar works done abroad. It is written both for the student of medicine and of biology, and in the past few months since its appearance has taken its place in both these departments of science as a standard, based upon the higher modern conception of medicine as *applied biology*.

By the labors of Gegenbaur, Turner, Cunningham, the death knell of human anatomy taught *per se* has been sounded. It is safe to predict that not only in the brain, but in the muscles and viscera, all medical teaching of the near future will advance to the long ignored truth that man is not only a vertebrate, but a mammal and a descendant of the primates, and that a thoroughly intelligent conception of the human body can only be gained by comparison. Professor Minot will do much to further this progressive idea in medical instruction in this volume, which might very appropriately be called a text-book of vertebrate embryology. In human embryology we are, of course, limited to material obtained after death or by accident, and, considering these limitations, we are surprised by the vast amount of information which the author has brought together upon strictly human development, in addition to the ample treatment of the general features of development of lower types.

These results of ten years' original research and careful compilation from Kölliker, Hertwig, Balfour, Duval, his and others, are brought together in a volume of nine hundred pages which reflects the greatest credit both upon the author and the publisher. There are five hundred illustrations, many of them entirely original and altogether admirably printed. The work, as a whole, marks a great step forward, because it maintains a high level both in thoroughness and in form of publication, as the two essential elements of a successful work. It is difficult for any one not an embryologist to appreciate the labor represented in these pages. The progress of this branch of science has been so rapid, both in respect to fact and to theory, that in a work covering so much ground it is impossible to keep pace with fact and theory. It is this circumstance which should temper our criticism of some portions of the work which are not quite up to date.

The volume opens, appropriately, with a description of the uterus and a general outline of human development. The history of the ova and spermatozoa follows, concluding with the theories of sex. The author is well known as having early advanced the theory that the mature sexual elements differ in respect to sex, stated broadly, that the ovum is a female and the spermatozoan is a male cell. Now, this theory, with others of a similar character, has broken down under the criticisms of Weismann and researches of Hertwig, and has been generally

abandoned; yet the author, while fairly stating other views, decidedly leans toward his own—a position which would be perfectly proper in a memoir, but which is out of place in a student's text-book. It is the occasional outcrop of personal bias in the retention or defence of opinions with which the author's name has been associated, either as an originator or a supporter, which constitutes the most serious, in fact, the only serious, defect in this work. Other defects are of minor importance, or unavoidably spring from the immensely wide field covered. The writer of a text-book should ruthlessly sacrifice his most cherished theories if they do not accord with the latest research.

The next section is devoted to the three germ layers of the developing ovum, leading us to the embryo in the third section and the foetal membranes in the fourth. Through all these pages the author sustains his plan of maintaining a critical attitude, and, as far as possible, verifying his statements by his own observation. Each mammalian structure is introduced by a brief and clear statement of its mode of appearance in the fishes, amphibians and reptiles, rendering these chapters as valuable to the general as to the special student. Duval, in his recent monograph on the placenta of the Rodentia, speaks in high terms of Professor Minot's work upon the placenta, but differs with him in regard to the so-called ecto-placenta, holding that he has mistaken the ecto-placental columns and tubes for the uterine glands.

The latter half of the work is given to the general development of the foetus and the organology or special development of each of the systems and organs of the body. Here, again, the accuracy and breadth of treatment. The pages simply bristle with information upon every subject treated, giving a thoroughly encyclopædic character. The chapter upon the development of the brain alone is the most complete which has yet appeared, and is thoroughly up to date. One minor protest must be entered here, that is against the use of the Anglicized German term "aulages" for the beginnings of structures. As pointed out by Hurst, Parker and others, we have already an excellent term in the English "rudiment." A

"rudimental structure" is, properly speaking, an incipient structure, although often improperly used to designate a disappearing or "vestigial" structure.

The bibliography is very complete. The author shows the utmost readiness to give full acknowledgment to his authorities, and appreciates the importance of acquainting the student with the literature at every step. We know of no other work so full of references. Yet there is a matter which certainly should be remedied in a future edition of the work—the titles are referred to by volume numbers and pages, and not by date; this omission renders it very difficult to keep in mind the historic development of the subject. It is safe to say that four out of five persons in this country who will use this book will not be able to consult periodical files for the date.

In conclusion, we would repeat our high opinions of this work. It is certain to find its way into every medical and biological laboratory in the country, carrying with it the author's spirit of thoroughness in investigation and breadth of view in treatment, and cannot fail to exert a widespread influence upon American embryological research.

NOTES AND NEWS.

THE Congress of Evolutionists held the last week in September, in Memorial Art Palace Chicago, was a decided success and in every way a most satisfactory series of meetings. The Congress extended through three days—three sessions each day. The hall assigned to this Congress was well filled during all the sessions and crowded during some of them. After the opening address by B. F. Underwood, the Chairman, in which was sketched the progress of evolutionary thought, a paper on "Social Evolution and Social Duty," contributed by Herbert Spencer, was read, after which Edward P. Powell gave an address on "Constructive Evolution." During the Congress questions in "Biology" were treated by Dr. M. L. Holbrook, Dr. Edmund Montgomery and Rev. John C. Kimball. Edwin Hayden, Dr. Duren J. H. Ward, Mrs. Sara A. Underwood, Prof. T. J. Burrill, and Miss Mary Proctor (daughter of the great astronomer) paid tributes to "The Heroes of Evolution." Psychology as related to Evolu-

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tion was the subject of addresses by B. F. Underwood, Dr. Herman Gasser, Dr. John E. Purdon and Harvey C. Alford. Sociology was considered by Rev. A. N. Somers, Bayard Holmes, M. D., Mrs. Florence Griswold Buckstaff and Miss Mary A. Dodge ("Gail Hamilton"). "Religion as Affected by Evolution" was the subject of papers and addresses by Dr. Charles T. Stockwell, Rabbi Emil G. Hirsch, Rev. Howard MacQueary, E. P. Powell and others. Rev. M. J. Savage, Dr. Lewis G. Janes, C. Staniland Wake, Revs. Jenckin L. Jones and H. M. Simmons presented papers on "The Morals of Evolution." "Economics as Related to Evolution" was considered by James A. Skilton and others. An interesting feature was a symposium on this subject in the form of brief papers from Mr. John Fiske, Dr. Edmund Montgomery, Dr. R. W. Shufeldt, Benj. B. Kingsbury, F. M. Holland and others. There was not a note of discord during the entire Congress. A committee was appointed at a special meeting held last Sunday evening to arrange for another Evolution Congress in 1894.

—Those who are familiar with the volumes of Appleton's "International Education Series" will remember among them two on "The Mind of the Child," by W. Preyer, professor of physiology in the University of Jena; and the same author has now issued a smaller book on the same subject entitled "Mental Development in the Child," which has been translated into English by H. W. Brown, and published in the same series. The work is designed especially as an aid to mothers in training their young children; but we confess that we cannot see what mothers are to gain from it. It contains, to be sure, many sensible observations; but they are mostly commonplace, while on the other hand the book is full of doubtful physiological speculations expressed in technical language. Take, for instance, the following remarks about self-consciousness: "There are several grades of consciousness, lower

and higher, which have different seats—in the higher animals, particularly in the spinal marrow, cervical marrow, and brain. The highest grade, self-consciousness, so-called, which does not necessarily imply a strong self-esteem, has its seat in the gray substance of the cerebral cortex. It is therefore properly called the cortical *ego*." (p. 155). There is much more in the book of a similar sort; yet the reader must not think that there is nothing better. Professor Preyer has evidently been a close observer of very young children, and is familiar with their wants and ways; and he gives a fairly intelligible outline of their mental growth during the first three years of their lives. His remarks on the acquisition of language and on the manifestations of thought and reasoning before language is acquired are perhaps the best things in the book and are well worthy of attention from students of psychology. But the book cannot be accepted as a satisfactory treatise on the subject with which it deals.

—W. F. Yocum, A. M., D. D., accepted the position of Vice President and Professor of Philosophy and Political Economy in Florida Agricultural College, Oct. 1, 1893.

—Miss Mary Proctor, daughter of the late Richard A. Proctor, is delivering courses of lectures on astronomy to children, under the management of Major J. B. Pond, Everett House, New York.

—The Eleventh Congress of the American Ornithologists' Union will convene in Cambridge, Mass., on Tuesday, November 21, 1893, at eleven o'clock A. M. The meetings will be held in the Nash Lecture-room, University Museum, Oxford street. The reading of papers will form a prominent feature of the meetings. Associate as well as Active members are earnestly requested to contribute. Titles of communications and applications for membership should be sent to the Secretary, Mr. John H. Sage, Portland, Connecticut.

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The letters which make up Miss Bacon's book were written during a residence in Tokyo as teacher in one of the schools for noble girls under the management of the Imperial Household Department. They are intimate in character, being chronicles of events and impressions imparted in a friendly and gossiping fashion to relatives at home, and having throughout that conversational atmosphere which, while wholly destructive of what is called "style," is a charming medium through which to view pictures of every-day life and character. The author frankly confesses that they resemble the product of a photographic camera rather than that of an artist's brush, and, having so said, she puts us quite at our ease and carries us along through her experiences in housekeeping, shopping and engaging of cooks, in *jinrikisha* riding and eating and church-going until we fairly forget our Occidental surroundings and begin to look about for a paper, parasol and a folding fan.

At the beginning of Miss Bacon's career she seems to have suffered much from the fact that her Anglicized Japanese was about as imperfect as the Japanized English of those about her. Time, however, meliorated this difficulty, and her comfort increased as the comedy of the situation lessened.

Not the least engaging of the subjects touched upon are the references to Japanese dress, festival and mourning costumes, and in some detailed descriptions, such as that of Yasaku's wedding and the Feast of Dolls at a Daimio's Yashiki, we have narratives of unusual interest. The volume is pleasant, chatty and withal instructive in such matters as a stay-at-home wishes to understand.—*Philadelphia Bulletin*.

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